IEOR 170, Fall 2000
Open-book Exam
11/6/2000

Part I -- 100 points
Human Factors Guidelines and Interative Design

Note: HCI = Human-Computer Interaction

1. (4pts)Match:

(1)	HCI designer	(a) Designs human-computer interaction
(2)	Interface software designer	(b) Designs interface software
		(c) Conducts user analyses
		(d) Conducts task analyses
		(e) Uses a programming language
		(f) Uses human-factors design guidelines
		(g) Takes system point of view
		(h) Takes user's point of view

2. (4pts)Match:

(1)	User interaction standards	(a) Company, product, and/or project-specific
(2)	User interaction design guidelines	(b) Contain specifically worded recommendations for various aspects of a user interface design
(3)	Commercial style guides	(c) Typically produced by one organization or vendor
(4)	Customized style guides	(d) Provides guidance on when & how to use a particular interaction style or object
		(e) Human factors for user interfaces
		(f) Provides much of the foundation for producing a style guide as well as the HCI design
		(g) Official, publicly available documents that list requirements of HCI design
		(h) Must be followed, enforceable by contract or law

Guidelines from H&H:

3. What is the best strategy among those listed below for designers to employ to handle potential user errors?

   Provide informative feedback describing the error in users' language.
   Make it easy for users to reverse any action performed.
   Ensure user cannot perform actions that have catastrophic results.
   Anticipate and design to prevent user errors.
   All of the above.

4. (2pts)List two ways designers help users get started with the system.

5. (3pts)Fill in the blanks:
   Each user of a design develops a _____ of it and refers to this model when trying to understand or predict system behavior. The system projects a _____

_____ through its H-C interaction and documentation, and users develop and refine their _____ _____ of the system primarily from this.

Designs should project _____ _____ that allow users to develop accurate _____, _____ based on user tasks rather than on engineering details of the design or its implementation.

6. (2pts)An HCI design guideline says to keep things simple. In terms of its decision tree, what types of structures do simple tasks have?

7. (1.5pts)Match the guideline with the type of memory involved.

(1) Long term memory	(a) Give user frequent closure on tasks
(2) Short term memory	(b) Let users recognize rather than recall whenever feasible.
	(c) Keep the number of items that users must search or select from at 8 or less (e.g., in menus, etc.)

8. (2pts)List two important properties of good feedback in HCI design.

9. True or False Users prefer HCI designs that act like people (anthropomorphic designs).

10. (1.5pts)Fill in the blanks:
Use modes _____
Get the user's attention _____ ,
Maintain display _____.

11. (3pts)An HCI design guideline says designers should organize the screen to manage complexity. What are the six Gestalt rules of perceptual organization that designers use to suggest organization of display items to users?

12. (2pts)A design guideline says good design accommodates individual user experiences and differences. Suppose all users of a system are clones of one prototype user. Are there still important user differences for designers to consider in their design process? If so, what?

Human Limits & Differences

13 _____ assume your characteristics are those of the user.

14 True or False Some people have limits others do not?

15 (2pts)What are the two individual cognitive processing limits that are most interesting to the HCI designer?

16 Reaction times typically fall into what time range?
(i) 513-928 msec (ii) 113-528 msec
(iii) 313-728 msec (iv) 413-828 msec

17 (2pts)Matching:

(1)	Fast people hear & respond	(a) In 200 msec
(2)	Fast people see & respond	(b) In 150 msec
(3)	Fast people smell & respond	(c) In 700 msec
(4)	Fast people feel pain & respond	(d) In 300 msec

18. (2pts)The fastest response times occur when people _____, _____, _____, and _____ the stimulus simultaneously.

19. (3pts)Matching:

(1)	Leads to shorter reaction times	(a)	Fatigue
(2)	Leads to longer reaction times	(b)	Depressant drugs
		(c)	Practice
		(d)	An alert just prior to the signal
		(e)	Stimulus increased in size or complexity
		(f)	Response requires complex movements

20. (2pts)Fill in the blanks:
People appear to establish their own _____ level on a _____ - ___ - _____basis and then attempt to meet it. With experience a person achieves a level of _____, that is the most comfortable in terms of achieving the _____ goals.

21. A person's accuracy level depends on which of the following?
(a) The tasks
(b) The penalty for errors
(c) The individual
(d) All of the above

22. True or False Accuracy always decreases as speed increases?

23. True or False Accuracy never increases as speed increases?

24. How many distinct sizes, brightness levels, loudness levels, line-lengths, etc. can people accurately distinguish when the stimuli are presented separately?
(i) 5-9 (ii) 4-11 (iii) 4-7 (iv) 7-11

25. (3pts)Matching: When people make estimates they tend to error in specific directions depending on the situation.
When estimating:

(1)	people tend to underestimate	(a) Elapsed time, when actively involved
(2)	people tend to overestimate	(b) Distance
		(c) Vertical height when looking down
		(d) Temperature of cold objects
		(e) Bulky weight
		(f) An uncounted number of items

26. True or False eople can consciously concentrate on several things at once.

27. True or False eople can do only one thing at a time.

Sensing & Responding

28. How many senses do humans have?

29. (6pts)Which three human senses are the most important to human performance engineering and HCI design? List and define each and briefly explain the primary reason for its relevance to HCI design.

30. Which sense is used to inform your brain of the position of your body parts and of their relative directions and rates of movement?

31. The human sense of hearing is a mechanoreceptive sense, for the ear responds to the mechanical vibration of sound waves in the air. Match the mechanical property of the sound wave to the perceived property of the sound:

(1)	Intensity	(a)	Loudness
(2)	Frequency	(b)	Pitch

32. (1.5pts)Fill in the blanks:
The decibel scale

(a) A _____ - fold increase in sound intensity is called 1-bel
(b) One _____ of a bel is called a decibel.
(c) In the usual sound range for human communications, the human ear can detect about a _____ decibel change in sound intensity.

33. What range of frequencies does the human ear typically respond to?
(a) 200 Hz - 25,000 Hz, (b) 500 Hz - 15,000 Hz, (c) 20 - 20,000 Hz (d) 500 - 25,000 Hz

34. (2pts)Matching:

(1)	Frequency range requiring least intensity to be heard	(a)	100-8000 Hz
(2)	Frequency of range of normal voice	(b)	1000-8000 Hz
(3)	Loudness of average speech from 1 meter	(c)	40 db
(4)	Loudness of speech that obtains maximal level of intelligibility	(d)	67 db

35. If a signal level is 60 db and the background noise level is 45 db, what is the signal-to-noise ratio (S/N ratio)?

36. Most voice sounds are readily distinguished as long as the S/N ratio is greater than or equal to _____.

37. Which of the following strategies for designing vocabularies are good ways to improve hearing accuracy and/or decrease loudness requirements.

(a) Limit vocabulary size
(b) Use short, familiar words
(c) Use standard language
(d) Allow users to generate the vocabulary for you
(e) All of the above
(f) (i) - (iii) only

38. (1.5pts)As a rule of thumb, designers should try to accommodate 95% of their user population's dimensions and limitations. Match the physical property with the segment of the user population to accommodate.

(1) Reach	(a) Exclude both the upper & lower 2.5% extremes
(2) Clearance	(b) Exclude the lower 5%
(3) Ranges	(c) Exclude the upper 5%

39. (2.5pts)Matching: Match visual angles with descriptions.

(1)	Preferred visual angle if reading speed important	(a) 10' of arc
(2)	Minimum visual angle if reading speed important	(b) 45' of arc
(3)	Maximum visual angle if reading speed important	(c) 16' of arc
(4)	Smallest visual angle if reading speed not important	(d) 24' of arc
(5)	Largest visual angle if reading speed not important	(e) 21' of arc

40. Which of the following are normal means used by the human visual apparatus to perceive depth?

(a) Relative size of objects
(b) Moving parallax
(c) Binocular parallax
(d) All of the above

41. (2pts)Match the type of light-sensitive receptor with its properties.

(1) Cones	(a) Used for seeing bright light
(2) Rods	(b) Used for seeing dim light
	(c) Color-sensitive – different versions are selectively sensitive to red, green, and blue.
	(d) Sensitive to dim illumination of any color except red

42. (2pts)Visual field: Match the visual field with the description. Note that vertical plane = horizontal plane = 0° with head level and facing straight ahead.

(1)	(-70°, 104°)	(a) Vertical color vision field
(2)	(-166°, 166°)	(b) One-eyed visual field, motionless
(3)	(-60°, 60°)	(c) One-eyed visual field w/ rotation of eyes
(4)	(-30°, 40°)	(d) Two-eyed color vision field (horizontal)

43. (2pts)Matching:
According to the Tri-Color theory of human color perception, humans perceive colors depending on the relative intensities of three specific wavelengths of electromagnetic energy present in the stimuli received. The types of cones in the human eye have sensitivity peaks at 573, 535, and 430 millimicrons. Red monochromatic light has a wavelength of 610 millimicrons, and blue monochromatic light has a wavelength of 450 millimicrons. Match the color perceived to the vector of relative intensities striking the three types of cones.

(1)	blue	(a) (10:10:10)
(2)	red	(b) (75:13:10)
(3)	black	(c) (0:14:86)
(4)	white	(d) (0:0:0)

44. According to the Tri-color theory of human color perception, a color cannot be perceived unless its corresponding monochromatic wavelength is actually received as part of the electromagnetic stimuli?

Cognitive Processing & Performance

45. (2pts)Fill in the blanks.
Automatic processes begin as _____ processes. The _____ part of the process is reduced as practice makes the process easy to perform accurately without constantly evaluating the results of the actions. Muscle movements become _____ and little or no _____ evaluation of outcome occurs when processes become _____

46. (2pts)Fill in the blanks:
For many activities, one of the main objectives of the designer is to realize a shift of as many tasks as possible from _____ to _____ control in the shortest time possible.

47. (2pts)For the skills that eventually become highly automatic, more experienced people make more errors overall. Is this statemer True or False plain why.

48. (3pts)Match the description with the level of processing:

(1) Conscious processes	(a) Relatively inflexible and difficult to change
(2) Automatic processes	(b) Relatively flexible and easy to change
	(c) New tasks, infrequent tasks
	(d) Slow and considered responses
	(e) Frequent, practiced tasks
	(f) Fast, reflex-level responses

49. (2pts)Matching: Match the type of human memory with its property.

(1) Short term memory	(1) Limited amount of information can be stored
(2) Long term memory	(2) Time and effort required to retrieve information
	(3) Info is automatically retrieved with minimal effort
	(4) No capacity limit

50. (2.5pts)Design Processes: Place activities in order of use during a user-centered design cycle.

(a) Conceptual design
(b) Redesign
(c) Task analysis & User analysis
(d) Visual layout/scenario design
(e) Early user feedback
(f) Heuristic usability evaluation (hint – you need a detailed design to do this)
(g) User testing/evaluation of user test data
(h) Needs analysis
(i) Detailed design
(j) Prototyping

The Design of Everyday Things.

51. (3pts)List the seven principle of user-centered design.

52. (2pts)List the four principles of good direct manipulation interaction design.

Usability Heuristics

53. (2pts)Matching:

(1) partially red-green colorblind	(a) 0.005% of males and 0.003% of females
(2) fully red-green colorblind	(b) 6% of males, 0.4% of females
(3) yellow-blue colorblind	(c) 2% of males and 0.03% of females
(4) completely colorblind	(d) 0.005% of males and 0.003% of females

Part II – 50 points
Heuristic Evaluation

Conduct a heuristic evaluation of the current IEOR 170 web site. Color images of the various screens you must evaluate are attached to the back of this exam. To receive the maximum allowable points for this part of the exam find and list, along with the corresponding guidelines in violation, as many legitimate usability problems as found by any other student taking the exam. The more you find, the more credit you earn on part II.

There are many guidelines in violation. Use the web-based heuristics and you'll easily find 15-25 violations. You may need to repeatedly scan through all the images and imagine the interaction in your mind for a few minutes before you begin to notice violations of web-based guidelines. Once you get going, the more you look the more violations you'll find!